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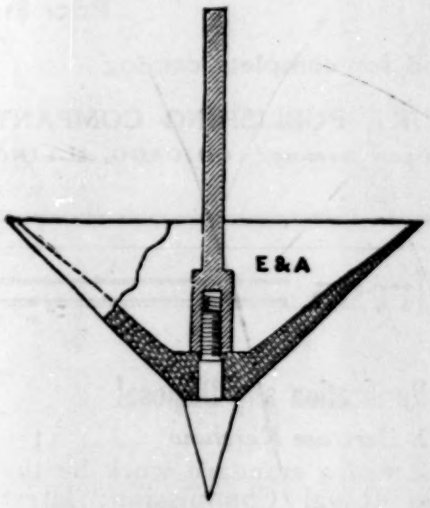

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WILLIAM BATESON

WITH the recovery of Mendel's paper a new era in the study of heredity began. Bateson at once became a recognized leader in the new movement. His earlier work on variation had supplied him with a wealth of material that only waited the clue that Mendel's theory afforded, and his experimental work on discontinuous variations, that had already started before 1900, had prepared him for the acceptance and realization of the profound significance of the new theory.

The ardor with which Bateson undertook to apply, test and extend Mendel's discovery, the keenness that he brought to bear on the new work, and the complete frankness with which he discussed "unconformable cases" had a wide influence on the rapidly growing school of genetics.

He did not try to hide his contempt for second-rate work, and he was unsparing in the exposure of the pretensions of those who were satisfied with lower standards. This sometimes led to acrimonious rejoinders, but it put fear into the hearts of those who continued to use an outworn phraseology of variation and heredity that no longer had any real significance. He hit and he hit hard! If he disagreed he said so flatly, and could always give a cogent argument for his disagreement. His intellectual rectitude was beyond all praise and recognized by friend and foe alike. His courtesy and hospitality were unfailing, and he will be missed by a host of admirers, and regretted, I can not but think, by those of his opponents who found him a foeman worthy of their steel.

His own work extended the fundamental principles of genetics in many directions. The more difficult the problem the more it attracted him if it offered an opportunity for exact experimental investigation. The perseverance with which he followed every clue —"treasure your exceptions," he said—and the high standards of work that he insisted on for himself as well as for others made a deep impression on his colleagues. His death came suddenly in the midst of his labors, and students of genetics the world over have felt deeply the loss of a friend of outstanding intellect and commanding personality.

Bateson's first important contribution dealt with material collected in this country in 1883. He had seen an announcement in the Johns Hopkins University circular that Balanoglossus had been found at the Marine Station, then situated at Hampton, Virginia, and wrote to Brooks asking permission to

come to the station to work on this rare and extraordinary worm. "Brooks sent me a cordial invitation to come over and try. Such leave was no little thing to give, for Balanoglossus must have been known to be one of the prizes of the station, but in professional generosity Brooks was royal and lavish." The friendly relation between Brooks and his students that had so much to do with his influence over them was soon established with Bateson. At the time Brooks was absorbed in writing his treatise on heredity. Bateson wrote later (1910): "For myself I know it was through Brooks that I first came to realize the problems which for years have been my chief interest and concern." "Variation and heredity with us had stood as axioms. For Brooks they were problems. As he talked of them the insistence of these problems became imminent and impressive."

The material collected at Hampton and in the following year at Beaufort, N. C., led to papers on the early stages of development and on the morphology of the adult worm. In a later paper on "The Ancestry of the Chordata" Bateson discussed, in guarded terms, the position of Balanoglossus in relation to the vertebrates, reaching the conclusion that the structural resemblances indicated relationship and that the unsegmented nature of the notochord and central nerve cord indicated that the ancestor was not segmented, and that the repetition seen in the body cavities and gill-slits must have had an independent origin. This question of repetition haunted Bateson for the rest of his life. His later conclusion is interesting.

> The meaning of cases of complex repetition will not be found in the search for an ancestral form which, itself presenting the same character, may be twisted into a representation of its supposed descendant. Such forms there may be, but in finding them the real problem is not even resolved a single stage; for from whence was their repetition derived? The answer to the question can only come in a fuller understanding of the laws of growth and of variation which are as yet merely terms.

At the present time, forty-three years later, this statement may still stand word for word.

In 1894 appeared "The Materials for a Study of Variation" which has recently been called Bateson's most important work. Here he brought together a great number of widely scattered cases bearing on discontinuity in variation. It is the particular use that Bateson made of this evidence that is the most interesting feature of the book. He argued that since evidence for discontinuity is to be found everywhere in animals and plants, evolution through natural selection, which he interpreted to mean by the selection of continuous variation, will not account for the origin of species. This relationship of variation to species-formation was a problem that interested Bateson intensely. He recurs to it over and over again in his later writings.

This book on discontinuity in variation appeared six years before de Vries's mutation theory, in which discontinuity in inheritance is the central theme, but Bateson seems never to have become convinced that the discontinuity shown by de Vries's mutants in Oenothera furnishes the sort of evidence for discontinuity which he himself appealed to as supplying the materials for evolution.

In the preface to "The Materials" Bateson says, referring to his earlier discussion of the phylogeny of the vertebrates, "over it all hung the suspicion that the then current morphological arguments and interpretations might not be sound." In these discussions we are continually stopped by such phrases as "if such and such a variation then took place and was favorable." Again, "the whole argument is based on such assumptions as these—assumptions which, were they found in Paley or Butler, we could not too scornfully ridicule." Bateson set himself, therefore, the task of collecting and codifying the facts of variation as "the first duty of the naturalist." He brought together a great body of evidence from the literature and from this he reached the conclusion that the *forms* of living things taken at a given moment show a discontinuous series and not a continuous series. He also argued that the forms of living things may be separated into specific groups or species, "the members of each such group being nearly alike, while they are less like the members of any other group." Assuming that the doctrine of descent is true in the main because of the difficulty of forming any alternative hypothesis as good, he then examined the theory of natural selection in the light of these conclusions. On the theory of natural selection "specific diversity of form is consequent upon diversity of environment and diversity of environment is thus the ultimate measure of diversity of specific form. But "diverse environments often shade into each other insensibly and form a continuous series, whereas the specific forms of life which are subject to them on the whole form a discontinuous series." The magnification of this difficulty furnishes the basis of Bateson's critical attitude towards Darwin's theory.

He points out that while the study of the adaptation of living things was undertaken as a test of the theory of natural selection its study ceases to help us at the exact point at which help is most needed. "We are seeking for the cause of the differences between species and species and it is precisely on the utility of specific differences that the students of adaptation are silent. For, as Darwin and many

others have often pointed out, the characters which visibly differentiate species are not as a rule capital facts in the constitution of vital organs but more often they are just those features which seem to us useless and trivial . . ." "In the early days of the theory of natural selection it was hoped that with searching the direct utility of such small differences would be found, but time has been running now and the hope is unfulfilled." "Hence though the study of adaptation will always remain a fascinating branch of natural history it is not and can not be a means of directly solving the origin of species."

Bateson's general conclusion is summed up in the statement "that the discontinuity of which species is an expression has its origin not in the environment nor in any phenomenon of adaptation but in the intrinsic nature of organisms themselves manifested in the original discontinuity of variation." "The discontinuity of species results from the discontinuity of variation."

When in 1900 Mendel's paper (1865) was brought to light and confirmed by the results of de Vries, Correns and Tschermak, Bateson at once realized its importance. He was at the time himself engaged in a study of the inheritance of discontinuous variation and had become familiar with evidence that falls into line with Mendel's interpretation. He republished (1902) the English translation of Mendel's paper that had been prepared by the *Journal* of the Royal Horticultural Society (1900), and emphasized its far-reaching application. In collaboration with Miss Saunders, Bateson sent in his first report of the work to the evolution committee of the Royal Society (Dec. 17, 1901), which was published in 1902. In this report experiments of Miss Saunders with plants (Lychnis, Datura and Matthiola) and Bateson's with poultry furnished an admirable verification of "Mendel's Law" and served as a sufficient reply in themselves to an inadequate and prejudiced critique of Mendel's results that had appeared in *Biometrica*. As I have said, in the first edition of the "Principles" in 1902, Bateson took up the cudgels in defence of Mendel's work. His vigorous onslaught (based on direct familiarity with the facts in the case) on Weldon's misleading review of Mendel's work made it impossible that the importance of the new discovery should be overlooked or disregarded. "The study of variation and heredity *must* be built on statistical data, as Mendel knew long ago; but as he also perceived the ground must be prepared by specific experiment. The phenomena of heredity and variation are specific, and give loose and deceptive answers to any but specific questions. That is where our *exact* science will begin." In our sparse and apathetic community error mostly grows unheeded choking truth. That fate must not befall Mendel now."

Between the years 1902 and 1909 further reports to the evolution committee were made by Bateson and his collaborators. A large amount of exact information concerning heredity over a wide range of animals and plants appears in these reports. They have also a special interest to students of genetics. Each stage in the progress of the work that Bateson and his collaborators were carrying out at Cambridge is here set down. The reports give an insight both into the methods undertaken to study the problems and into the origin of some of the ideas at which Bateson later arrived. It is difficult to pick out any one subject as more important than another, but the work on stocks by Miss Saunders, the work of Hurst and of Bateson and Punnett on the inheritance of the shape of the comb and color of the plumage in poultry, the work on sweet peas by Bateson and Punnett contributed many important facts to the study of genetics. The explanation of the reversion that occurs when certain white races of peas are crossed, taken in connection with Cuénot's analysis of the relation of recessive whites to color determiners in mice, and the discovery of coupling and repulsion of certain characters in sweet peas (1900) (now more familiarly known as linkage) are two of the outstanding results that have had important developments in the extension of Mendelism. But in such an abundance of material it is difficult to select the more significant parts. One feature of these reports is characteristic. Nothing is glossed over for the sake of uniformity. Exceptions are reported and emphasized. Their examination whenever possible is the starting point for further study that is often illuminating. In a summary of genetic work up to 1906 (Progr. Rei. Botan.) Bateson made the following significant comment . . . "it is practically impossible to make any general statement as to which characters are dominant and which are recessive . . . It may be suggested that in the dominant type some element is present which is absent in the recessive type. The difficulty in applying such a generalization lies in the fact that not very rarely characters dominate which appear to us to be negative." As examples, the dominance of hornless cattle and of the abortive condition of the female organ in the lateral florets of barley are given. "Consequently we are almost precluded from regarding dominance as merely due to the presence of a factor which is absent in the recessive form. Not impossibly we may have to regard such negative characters as due to the presence of some inhibiting influence but in our present stage of knowledge there is no certain warrant for such an interpretation." This reserved attitude Bateson always held, returning to a discussion of it in a paper that appeared (*Jour. Genetics,* 1926) shortly after his death.

In 1913 the greatly enlarged second edition of the "Principles" appeared, summarizing Bateson's own work and that of the Cambridge School as well as that published elsewhere. This book has been for many years the reference book for students of genetics.

In the Silliman lectures given at Yale University in 1907 (published in 1913) some of the more general problems of biology were discussed in the light of the new discoveries in genetics. Bateson writes:

> On attempting a more general discussion of the bearing of the phenomena on the theory of evolution I found myself continually hindered by the consciousness that such treatment is premature and by doubt whether it were not better that the debate should for the present stand indefinitely adjourned. That species have come into existence by an evolutionary process no one seriously doubts; but few who are familiar with the facts that genetic research has revealed are now inclined to speculate as to the manner by which the process has been accomplished.

These lectures carry the reader far afield. From beginning to end the problem of species is under examination. Bateson's first-hand information relating to a wide range of subjects is nowhere more manifest than in these lectures. The difficulty of explaining the origin of species through the survival of better adapted individuals is again subjected to drastic criticism mainly on the ground that the distinctiveness of species—a view towards which Bateson strongly inclined—bears no demonstrable relation to their fitness for the particular environment in which they live. This contention, which has long been a stumbling block to selectionists and is inherent in Darwinism taken literally, has seemed less significant to others who, following Darwin, do not find the distinctiveness of species as sharply marked as Bateson postulates, and who find no real difficulty in the absence of adaptive features in those characters chosen by systematists in defining species. For on the one hand it is recognized that the characters chosen are, for the most part, arbitrarily picked out because they are constant, hence are not necessarily the characters that furnish the basis for selection of the types in question, and on the other hand it is recognized that there is no serious difficulty in accounting for the constancy of these chosen specific characters provided they are recognized as by-products of physiological factors themselves of real importance for the welfare of the individual.

In the summer of 1914 the British Association met in Australia and Bateson gave the presidential address—on heredity. Here he goes over much of the ground covered by "The Materials" and "The Problems of Genetics" but develops farther in a tentative and speculative vein some of his earlier views. He was frankly skeptical concerning the nature of the elements or *factors* of Mendelian nomenclature which he thinks are sorted out amongst the offspring by a process of cell-division in an orderly fashion. "That they are in some way directly transmitted by the material of the ovum and of the spermatozoon is obvious, but it seems to me unlikely that they are in any simple or literal sense material particles. I suspect rather that their properties depend on some phenomenon of arrangement." Thus, in a guarded way, he definitely disassociated himself from the movement then already in full swing that identifies the genetic elements with the stable materials of the chromosomes. He also states that he is entirely skeptical as to the occurrence of segregation solely in the maturation of the germ-cells which he thinks "as almost decisively" negatived by the different factors carried by the male and female organs in certain plants. Later work, however, has shown that these differences find a reasonable explanation as the result of gametic lethals, although Bateson seems never to have appreciated the genetic evidence for this conclusion. Probably the most novel feature of the Australian address is the application of the presence and absence hypothesis to the possibilities of evolution through loss. He quite frankly points out where that view leads. If, he says, we *may* have to forego the claim that variations arise by the *addition* of "factors" and if, as he believes, the evidence favors the view that all known mutant changes are due to losses, it would seem to follow that if evolution is based on such variations it is due to degradation of the original germ-materials. Curiously enough, in the same summarization he suggests the possibility of fractionation of factors which would appear as a half way step but which possibly might equally well be interpreted as any kind of a change in a gene. The evidence adduced for fractionation is, however, based on changes in visible characters that can hardly in the light of recent development be claimed as a substantial argument. The highly speculative nature of these suggestions he fully realized and adds the caution: "I do not suggest that we should come to a judgment as to what is or is not probable in these respects. As I have said already, this is no time for devising theories of evolution and I propound none."

The second part of the address delivered at Sydney goes over much the same ground that Bateson had already covered in his Herbert Spencer lecture (1912). On these two occasions only, has Bateson ventured to express his views on the biological aspects of the structure of human society. In plain language he points out the appalling lack of conscious foresight in the preservation of the human race and the effect of the modern tendency to preserve the socially unfit.

He points to the immense variability in the human stock:

> How hard it is to believe the polymorphism of man . . . How few of these could have changed parts with each other. . . . In no wild species, not even among the ants do we find any polymorphism approaching to this. I never cease to marvel that the more divergent castes of civilized humanity are capable of inter-breeding and producing fertile offspring from their crosses. Nothing but this paradoxical fact prevents us from regarding many classes even of Englishmen as distinct species in the full sense of the term. . . . The problem that confronts the political philosopher is to find a system by which these differentiated elements may continue together to form a coordinated community while each element remains substantially contented with its lot.

Bateson's conviction that many of the observed physical traits that distinguish individuals trace back to genetic differences will be applauded by students of human heredity, and his contention that a mixed population may better serve the purposes of modern civilization than a homogeneous one, may not be contested, but there may still be grave doubt as to whether these observable differences play as important a rôle in the advance or retardation of a social group as do the traditional and economic influences that determine the behavior of the group as a whole. It is noticeable that the rigorous standard that he demands in others dealing with Darwin's theory of natural selection scarcely warrants some of the bold prophecies he makes concerning the future of the human race under present conditions. "The essential difference between the ideal of democracy and those which biological observation teaches us to be sound, is this: democracy regards class distinction as evil; we perceive it to be essential." Aside from the view as to what democracy is or is not, it must be questioned, I think, whether "biological observation" has anything authoritative to say on the matter, since the fabric out of which political systems are made and transmitted from one generation to another involves mental processes about which at present biological observation has little if anything that is worth while to contribute.

In 1910 Bateson accepted the directorship of the John Innes Horticultural Institution, which became a center of research in genetics. Here in collaboration with associates and students he turned out year after year a series of important papers dealing with several difficult problems in heredity. The more significant of these contributions deal with (1) the inheritance of "rogues" in peas whose peculiarities Bateson was inclined to believe could throw light on the problem of the time of segregation of characters; (2) the variation shown by root cuttings, probably a periclinal phenomenon; (3) the inheritance of double flowers and sex characters in begonias; (4) studies on variegation; and (5) on the genetics of Primula, etc. Bateson was attracted by these problems partly because they were puzzles, partly no doubt because they did not seem to conform to the then current methods of genetic analysis and might therefore open up new fields of adventure.

Bateson brought to his work an exceptionally wide and first-hand familiarity with plants and animals. He had also an extensive knowledge of the literature of his subject at command and an ability to express himself fearlessly in classical and clear English. His personal interests extended far beyond the immediate fields of his researches. His deep interest in painting and other forms of art must have surprised his scientific friends when they discovered it for the first time, and his artist friends would no doubt have been equally surprised to have discovered his far-reaching influence on the biological science of his time.

T. H. MORGAN
COLUMBIA UNIVERSITY

THE RELATION OF MAPPING TO MODERN CIVILIZATION[1]

WHEN the pioneers, with their covered wagons, started west from Kansas City and other points in Missouri, they felt little need for maps except those of the crudest type. They had imagination or they would not have started forth; but like every other age, they did not see much beyond the present and could not visualize what was coming. Railroads, hydroelectric developments, growth of modern towns and cities were beyond their imagination. Accordingly, when the time came for establishing boundaries and making maps, they, like men of every other age, met the present needs and were little concerned about the future. The division of land was their first concern. As the land had little value, moderately correct surveys were considered quite sufficient. In many places the points were marked temporarily, rather than for permanent use, and were lost in a few years. One of the results has been a great deal of litigation, and in the case of lands which later became of great value, such as oil fields, the cost of litigation has undoubtedly been greater than good maps would have cost if made in the first place.

In the early work the magnetic compass was much used, and this fact has been blamed for a great deal of inaccuracy. Recent investigation has shown that in most cases it was quite as much the use of careless methods that was responsible for the defects of the survey. The magnetic compass is an easy instru-

[1] Presented before Section M, American Association for the Advancement of Science, Kansas City, December 30, 1925.

ment to use, but to secure good results it must receive quite as much care as the engineer's transit. The changes in the earth's magnetism were not understood, and many errors resulted from this. In some cases an early survey was extended and the same declination was adopted, disregarding the change during the intervening period. In the early survey chains were used for measuring distance and these quite frequently were in error or changed their length considerably with use. It must be recognized, however, that in many cases the value of the land did not warrant the cost of accurate surveys, and in some parts of the country this condition still holds. However, as we can not tell what is coming in the future, there is scarcely any part of the country where we can be absolutely sure that accurate surveys will not be of future value. In one region of active development in Texas, the original survey, according to reports of local surveyors, was made on horseback, at times under Indian attack, and the unit of measurement was the horse's pace, estimated at a vara or Spanish yard.

The day of the pioneer has passed, not only in our country, but practically throughout the earth. Land values have grown greatly, and many engineering projects relating to steam and electric transportation, road building, power development and transmission, reclamation of lands, etc., require, not the approximate idea of the early explorer, but the most accurate surveys that can be made. The state of Massachusetts early decided on accurate determination of all boundaries, and of points to which surveys could be referred. Various cities, among them New York, Cincinnati, Rochester, Richmond and others have felt the need of precise determinations and have executed geodetic triangulation.

No accurate mapping of any extended area is possible without taking into account the curvature of the earth. The early mapping of this country was defective, not only because there were no accurate surveys, but also because there was a lack of methods of taking into account the shape of the earth. The problem has not been entirely solved, but some of the modern projections meet all practical requirements. In the public land surveys the method of using a rectangular system with offsets at suitable intervals to provide for the convergence of meridians was adopted. This is a simple method, and yet one which leads to serious difficulties if not carefully executed. The chief difficulty is an instrumental one —that of running a continuous straight line without changes of direction creeping in. It has been found that the only sure way to run a straight line is to execute triangulation and thereby determine the exact relation of a number of points to the straight line desired. It is for this reason that accurate mapping of large areas is possible only if there has been a triangulation with astronomical determination of certain points. It is interesting to know that the topographic maps of the Geological Survey are based on accurate triangulation and leveling, in every case the framework being the result of triangulation and precise leveling of the Coast and Geodetic Survey.

The recent passage of the Temple Act by Congress, which contemplates the completion of the topographic mapping of the United States within twenty years, strongly emphasized the importance of the framework of triangulation. An illustration of the difficulties resulting when the triangulation is accurate but not connected throughout is given by an experience of the Coast and Geodetic Survey. In Alaska a great deal of triangulation has been executed in different regions. As the work extended these schemes were connected, but in every case discrepancies were found sufficiently large to interfere with the accuracy of the maps and charts. In order to meet this situation an arrangement was made with the Canadian government whereby the precise triangulation has been extended within the last few years from Tacoma, Washington, to Skagway, Alaska, each government carrying on the work in its respective area. From Skagway it is proposed to carry it into the Yukon territory, and thence into the interior of Alaska, to connect with the triangulation which has already been executed in that region. When this scheme is complete, all the detached triangulation will be connected and will be referred, like all other triangulations in the United States, Canada and Mexico, which have already been connected, to the same standard known as the North American Datum. One of the essential features of the North American Datum is that all points in the whole triangulation, whether in Canada, the United States or Mexico, can be directly connected to a selected point, which is the triangulation station at Meade's Ranch in Kansas, about 275 miles west of Kansas City.

One of the provisions of the Temple Act is to extend the present triangulation scheme so that there will be triangulation points every fifty miles throughout the United States. With such control it will be possible to have the desired accuracy in the topographic maps.

Not only are horizontal positions necessary for good mapping, but it is necessary to know the elevation of points. The precise level nets of the United States will also be extended so that there will be points whose elevation is accurately determined within easy reach of all parts of the United States.

With this system of horizontal and vertical control extended to the area to be mapped, the Geological Survey is able to prepare the topographic maps which have already won a most important place, even

though only 35 per cent. of the country is at present covered by adequate maps. The Board of Surveys and Maps has prepared a statement in regard to the need for and use of topographic maps, and I am indebted to this report for the following résumé of the advantages to be derived from complete mapping of the country.

The use of the maps in connection with the development of various utilities has been important. They proved invaluable in the development of the New York water supply. Many business enterprises which deal with natural resources find them of great use. Enormous development of highway construction has found the maps of value where they exist, and in other places has required the making of detached surveys which are of no especial value in mapping and which would have been unnecessary had the maps been available. Even though railroads are not now making the great extensions that formerly were common, they are giving great attention, especially in the western mountain country, to changes in route which will reduce grades and curves, and where topographic maps are available the project can be studied in a much more satisfactory way than if a series of detached surveys has to be made.

Water resources is a subject of increasing importance, and with many ramifications. The demands for power, for irrigation and for city water supply are steadily increasing. Accurate maps are of very great value in estimating the amount of available water and they are also useful in laying out the necessary canals or other water channels. This of course applies not only to irrigation systems but also to drainage systems, which in many regions are quite as important as irrigation systems are in others.

The soil maps, which meet an important need of the farmer, and geological maps can not be made until the topographic maps are available. It was this fact that led the Geological Survey to take up topographic mapping. Some oil field investigations can not be made in turn until the geological maps are available. Timber and grazing resources can best be treated as a whole by laying out the areas on maps, and in many places adequate maps are not available. The use of maps by travelers, especially those by automobile, is to be encouraged. While route maps may be sufficient to get through the country, those which tell something of the country passed through have educational value. The maps also are of great value for use in teaching geography. In many cases a lesson based on a local topographic map will make a strong impression on a child and will arouse interest in the study of geography which would otherwise remain unstimulated. Also the development of a habit of using maps will make sure that there will be a full return to the country of the cost of preparing them.

The use of accurate topographic maps in connection with the national defense is so obvious that it is not necessary to go into detail. The report names thirteen bureaus of the government concerned with many of the activities mentioned above, which will benefit directly by these maps; and this is only another way of saying that the whole people benefit. A government bureau must serve the people in order to justify its existence.

I have attempted to bring out the vital relation between the completion of the mapping program and the further development of many activities which have been outlined which underlie and form an essential part of what we know as civilization.

There is another form of map which is scarcely in existence as yet, but it is going to be more and more important as time goes on. This is the earthquake map.

During the past year the earthquake problem, which is always with us, has taken on a new significance. It has been brought home that earthquakes can occur anywhere in the United States, since they were felt in twenty-two states during the first nine months of 1925, not including some in which the St. Lawrence earthquake of February was felt. There were earthquakes in three different regions in Canada, in several parts of Alaska and in parts of Mexico adjacent to the United States during the same period. The St. Lawrence earthquake was felt strongly in New England and New York, and the Montana and Santa Barbara earthquakes were severe enough to call attention to the fact that cities in earthquake regions which are not built to stand earthquakes are in a dangerous condition. The fate of the cities of Tokyo and Yokohama is too recent to be forgotten.

Some of the utilities which, as I have stated, are facilitated by topographic maps, are jeopardized by earthquakes. These dangers are now being recognized and much effort is being put into the designing of buildings and all types of structures to resist earthquakes. It is true that these should be well built everywhere, whether there is earthquake danger or not, but at the present time this is scarcely practicable; nor is it possible to tear down old, weak buildings except in the case of real danger. It is important, then, to know where special precautions should be taken.

If accurate earthquake prediction, both as to time and place, were now possible, we should know exactly what to do. But it must be admitted that in spite of many predictions we know very little as to just where and when earthquakes are likely to occur. We should, then, for the present, be content with de-

termining accurately the areas where earthquakes have occurred and mapping them so as to indicate the intensity. Such maps would bring out clearly the evidence available from the past as to the need for special precautions, and by keeping them revised new regions of activity would be adequately mapped. There is also a demand for regional information from the insurance companies. At present, in view of the lack of knowledge as to earthquake probability, they have little on which to base their rates. Too high rates or too low rates are disadvantageous, both to the companies and to the public; as in the former case insurance will disappear with a decrease of earthquake activity, and too low rates will be disastrous to the companies should a great earthquake occur. The kind of maps indicated would be of great value in averaging the probability, based on past occurrences over a region. While these maps would not be an entirely satisfactory guide, they would give the only information we have at the present time.

It should not be forgotten that earthquakes may occur where none have been observed before in this country, as our knowledge covers a very short period, geologically speaking, and earthquakes are geological phenomena. Experience in Europe points to the recurrence of earthquakes in places where they have occurred before, and this must be our best guide for the future. There is a great deal of information available, but the task of putting it on maps has yet to be undertaken. The Coast and Geodetic Survey has been gathering material for such maps and hopes to begin their production before very long, and then revise them from time to time. The geologist will find it necessary to reconcile these maps with the geological formations, so that we are again brought back to the need for the topographic map. This illustrates how all these problems are tied together, and emphasizes the fact that mapping based on accurate control is becoming more and more necessary as time goes on.

E. LESTER JONES
U. S. COAST AND GEODETIC SURVEY,
WASHINGTON, D. C.

SCIENTIFIC EVENTS

DUTCH EXPLORATION IN CENTRAL BORNEO[1]

AN expedition has been at work in East Central Borneo during the past summer under the leadership of Captain D. W. Buys, with a view to exploring the only important area in the great island still remaining unknown. The undertaking has been promoted by the "Indisch Comité voor Wetenschappelijke Onderzoekingen," formed some years ago for the furtherance of scientific exploration in the Dutch East Indies, which has already much work to its credit in Ceram and elsewhere. The field chosen lies between the upper course of the Kajan river in the north and the headwaters of streams flowing southwards to the Mahakam, and falls mainly within the administrative subdivision Beraoe. The upland region which gives rise to numberless tributaries of the above great rivers, as well as to the smaller Kelai on the east, has hitherto been quite untouched by white men, lying considerably north and east of the routes of Nieuwenhuis, Molengraaf, and Lumholtz, though its eastern and southern fringes have recently been touched by a military patrol under Lieut. Soeratman and the American Gilbert, as well as by the Dutch geologist Witkamp, who is a member of the present expedition. It was hoped to carry out an accurate survey of as large a part of the area as possible, besides geological, botanical, zoological and ethnological researches. Under the last-named head a search was to be made for archeological remains from the Hindu period, and also for cave-dwellers of whom some rumors have been heard. After a full consideration of the best line of approach to the unknown area, that by the Telen river, the largest northern tributary of the Mahakam, was decided on, and the first report of progress describes the ascent of this river in canoes under considerable difficulties due to heavy rains and the obstacles caused by the many rapids and the rock-strewn bed of the river. Efficient service had however been rendered by the Dayak boatman under the energetic direction of the native chief Beng Wung. By the end of June the party had ascended the Telen almost to its source, and had thus reached the threshold of the unknown area, while various side trips had been carried out by the geologist Witkamp and the botanist Endert, the former of whom had ascended the Wahau, a northern tributary of the Telen, to its source. To the east was a flat or gently undulating massif of eruptive formation, with a series of Tertiary rocks resting against its western edge. West of the river no elevations of importance were seen. Emanations of marsh-gas were observed, but no sign of oil. Above the Wahau the Telen has a widening course through a level plain, with cut-off bends connected with the river only at high water. Here the surface is formed of recent alluvium and sand, but higher up the Tertiary strata come to light in the form of shales, grits and conglomerates, with beds of lignite interspersed.

[1] From the *Geographical Journal*.

THE AMERICAN MUSEUM EXPEDITION TO GREENLAND

CAPTAIN ROBERT A. BARTLETT, who commanded the steamship *Roosevelt* in which Admiral Peary

sailed in 1908 for the North Pole, left Bregus, Newfoundland, on May 10, in the 100-foot schooner *Morrissey* for New York. The ship will be taken to a Staten Island shipyard to be outfitted for an expedition to Greenland in quest of specimens for the new Hall of Ocean Life in the American Museum of Natural History. Permission for the expedition to land in Greenland has been granted.

Harrison Williams is financing the trip, which will be directed by George Palmer Putnam, treasurer of the publishing house of George P. Putnam's Sons. H. C. Raven, zoologist of the American Museum, will be their representative.

Others in the party will be Knud Rasmussen, Danish explorer and authority on Eskimo habits and customs; Robert E. Peary, 18-year-old son of the discoverer of the Pole, who will go in the capacity of engineer; David Binney Putnam, 12-year-old son of the director, who accompanied Professor William Beebe on his expedition to the Sargasso Sea; Edward Manley, amateur radio operator of Marietta College, Ohio, and Carl Dunrud, who will try roping walrus. There will also be an ichthyologist, a taxidermist, an artist, a motion picture photographer, surgeon and the usual ship's crew.

The *Morrissey*, built in Canada of oak, is the usual Newfoundland schooner type. Diesel engines will be installed in her and her entire hull will be covered with two-inch greenheart sheathing as protection against ice floes. Everything is expected to be in readiness so that the expedition can leave by June 10.

A special effort will be made by members of the party to gather specimens of the narwhal. No specimen of this animal exists in any American museum at this time, it is said. They also expect to get Greenland sharks, walrus, seal and various Arctic bird groups.

The advisory committee of the expedition, in addition to Mr. Williams, includes Cleveland E. Dodge, Fitzhugh Green, Colonel E. Lester Jones, Junius S. Morgan, Henry Fairfield Osborn, Jr., George H. Sherwood and Frederic C. Walcott.

AN INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

THE basis of a general international organization for industrial standardization was laid at the Third International Conference on Standardization, by unanimous agreement upon the draft of a constitution for the new international body. At this conference the national standardizing bodies in eighteen countries were officially represented, Hungary and Australia alone being without delegates.

The proposed constitution of the new organization, which is to be called the "International Standards Association," states the aims and objects of the association as follows:

> To lay the groundwork for international agreement upon standards by providing simple systematic means of interchanging information on the standardization work and activities in the different countries.
>
> To develop general guiding principles for the assistance of the national standardizing bodies.
>
> To promote uniformity among the standards of the various national bodies.
>
> It is the intention of the International Standards Association that its work shall include the approval of international standards and the administrative machinery herein set up is so designed that it may be readily extended or modified to include the approval of such international standards when sufficient experience has been acquired.

The members of the International Standards Association are to be the central national standardizing bodies existing in the different countries, one for each country, accepting this constitution. The chief executive body is to be the "plenary assembly," composed of delegates of all the national bodies, with the final authority resting with the latter. Provision is also made for an "administrative council," with control of finances and administrative matters, but with advisory powers in important questions.

The conference recommended that the seat of the new organization be in London, final decision to be made by the first Plenary Assembly.

The conference appointed a committee of seven to formally submit the proposed constitution to the twenty national standardizing bodies, and to arrange for a Plenary Conference for final ratification and organization. The countries represented on the committee are: Belgium, Czechoslovakia, Germany, Great Britain, Sweden, Switzerland and the United States.

During the sessions of the conference, informal negotiations were opened with the International Electrotechnical Commission (an international body now functioning in the specialized field of electrical engineering) in regard to a unified organization, and the committee of seven will undertake to secure joint action in the final organization which it is expected will be consummated when the Plenary Assembly is held.

CHEMICAL WARFARE SERVICE CONSULTANTS

THE following chemists were recently appointed consultants to the United States Chemical Warfare Service:

John J. Abel, Johns Hopkins University.
Roger Adams, University of Illinois.
Gellert Alleman, Swarthmore College.

W. H. Bassett, American Brass Co., Waterbury, Conn.
A. V. Bleininger, Homer-Laughlin China Co., Newell, W. Va.
Marston T. Bogert, Columbia University.
Cecil E. Boord, Ohio State University.
D. B. Bradner, Wilmington, Del.
Harold C. Bradley, University of Wisconsin.
W. C. Bray, University of California.
G. A. Burrell, Burrell Testing Laboratories, Pittsburgh, Pa.
F. K. Cameron, Salt Lake City, Utah.
E. M. Chamot, Cornell University.
N. K. Chaney, National Carbon Co., Cleveland, Ohio.
J. B. Conant, Harvard University.
F. G. Cottrell, Fixed Nitrogen Research Laboratory, Washington, D. C.
G. O. Curme, Jr., Carbide & Carbon Chemicals Corp., South Charleston, W. Va.
D. J. Demorest, Ohio State University.
C. R. Downs, New York, N. Y.
A. C. Fieldner, Bureau of Mines, Pittsburgh, Pa.
E. C. Franklin, Stanford University.
F. C. Frary, Aluminum Co. of America, New Kensington, Pa.
J. C. W. Frazier, Johns Hopkins University.
W. C. Geer, Goodrich Company, Akron, Ohio.
H. W. Gillett, Bureau of Standards.
R. A. Gortner, University of Minnesota.
B. C. Goss, Lake Erie Glass Co., Cleveland, Ohio.
W. D. Harkins, University of Chicago.
R. T. Haslam, Massachusetts Institute of Technology.
Yandell Henderson, Yale University.
C. H. Herty, Synthetic Organic Chemical Mfrs. Asso., New York, N. Y.
Arthur D. Hirschfelder, University of Minnesota.
H. N. Holmes, Oberlin College.
Henry Howard, Cleveland, Ohio.
N. H. Ittner, Colgate & Company, New York, N. Y.
D. D. Jackson, Columbia University.
John Johnston, Yale University.
Lauder W. Jones, Princeton University.
F. G. Keyes, Massachusetts Institute of Technology.
M. Kharasch, University of Maryland.
Victor Lenher, University of Wisconsin.
Dr. O. A. Leutwiler, University of Illinois.
G. N. Lewis, University of California.
W. Lee Lewis, Institute of American Meat Packers.
Arthur D. Little, Cambridge, Mass.
E. K. Marshall, Johns Hopkins University.
E. Mallinckrodt, Jr., Mallinckrodt Chemical Works, St. Louis, Mo.
Harlan S. Miner, Welsbach Co., Gloucester, N. J.
H. F. Moore, University of Illinois.
Hugh K. Moore, The Brown Company, Berlin, N. H.
Charles E. Munroe, Bureau of Mines.
William MacPherson, Ohio State University.
J. F. Norris, Massachusetts Institute of Technology.
J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.
W. A. Patrick, Johns Hopkins University.
W. A. Peters, Jr., E. B. Badger & Sons Co., Boston, Mass.
A. H. Pfund, Baltimore, Md.
L. V. Redman, Bakelite Corporation, Bloomfield, N. J.
E. E. Reid, Johns Hopkins University.
Allen Rogers, Pratt Institute, Brooklyn, N. Y.
Walter Rautenstraugh, New York, N. Y.
R. Norris Shreve, New York, N. Y.
Bradley Stoughton, Bethlehem, Pa.
E. C. Sullivan, Corning Glass Works, Corning, N. Y.
John E. Teeple, New York, N. Y.
Frank P. Underhill, Yale University.
D. D. Van Slyke, Rockefeller Institute.
Edward Washburn, Bureau of Standards.
E. R. Weidlein, Mellon Institute.
H. B. Weiser, Rice Institute.
Gerald L. Wendt, Dean, Pennsylvania State College.
T. L. Wheeler, c/o A. D. Little, Inc., Cambridge, Mass.
F. C. Whitmore, Northwestern University.
W. R. Whitney, General Electric Company.
A. C. Willard, University of Illinois.
F. W. Willard, Western Electric Co., Chicago, Ill.
R. E. Wilson, Standard Oil Company of Indiana.
James R. Withrow, Ohio State University.

The following constitute the American Chemical Society's Advisory Committee to the Chemical Warfare Service:

W. D. Bancroft, Ithaca, N. Y.
Bradley Dewey, Dewey & Almy Chemical Co., Cambridge, Mass.
F. M. Dorsey, Metal Protection Co., Cleveland, Ohio.
H. E. Howe, Mills Building, Washington, D. C.
Reid Hunt, Harvard Medical School.
L. C. Jones, New York, N. Y.
E. P. Kohler, Harvard University.
A. B. Lamb, Harvard University.
W. K. Lewis, Massachusetts Institute of Technology.
A. S. Loevenhart, University of Wisconsin.
C. L. Reese, E. I. duPont de Nemours Co., Wilmington, Del.
G. A. Richter, c/o Brown Co., Berlin, N. H.
Julius Stieglitz, University of Chicago.
L. T. Sutherland, Carbaloid Products Corp., Hastings-on-Hudson, N. Y.
Wm. H. Walker, Bridgton, Maine.

SCIENTIFIC NOTES AND NEWS

DR. WILLIAM T. HORNADAY, director of the New York Zoological Park, retires on June 1 from the position he has held for thirty years. His successor will be Dr. W. Reid Blair, at present assistant director. Dr. Hornaday will continue his association with the park as director emeritus.

PROFESSOR H. A. LORENTZ, of the University of Leiden, will be in residence at Cornell University during the fall of 1926 until the Christmas recess and will deliver a course of lectures on the Schiff Foundation dealing with selected topics in the field of theoretical physics. After leaving Cornell, Professor Lorentz will spend the winter quarter at the California Institute at Pasadena.

DR. F. H. KNOWLTON, of the United States Geological Survey, has been elected an honorary member of the Paleontological Society of Russia.

AMBROSE SWASEY, past-president and honorary member of The American Society of Mechanical Engineers, was the guest of honor at a testimonial dinner tendered by the Cleveland section of the society at the Hotel Cleveland, Cleveland, on May 14. Charles F. Brush, electrical inventor, presided. The principal address was delivered by Professor Dexter S. Kimball, dean of the School of Engineering, Cornell University, president of the American Engineering Council. J. Rowland Brown, chairman of the Cleveland section, read a large number of messages from eminent scientists, engineers and industrialists. James H. Herron, chairman of the committee in charge of the dinner, then presented Mr. Swasey with a testimonial bound in leather and signed by those present at the dinner.

PRESENTATION to the Franklin Institute of a portrait of Dr. Samuel Insull, president of the Commonwealth Edison Co., Chicago, and donor of the Franklin medal, was made in the hall of the institute on May 21. Speeches were made by B. E. Sunny, Howard McClenahan, secretary of the institute, and W. C. L. Eglin, president, to which Dr. Insull replied.

ABOUT one hundred physicians dined at the Harvard Club, Boston, on May 7, to honor Dr. Edward W. Taylor, James Jackson Putnam professor of neurology at the Harvard Medical School, on his sixtieth birthday. Dr. Harvey Cushing acted as toastmaster and informal remarks were made by Dr. C. Macfie Campbell and Dr. Fred B. Lund. Dr. J. W. Courtney read a poem.

DR. ROBERT DEC. WARD, professor of climatology at Harvard University, has been awarded the gold medal for 1926 of the Harvard Travellers Club.

DR. WALTER M. SCOTT, chief chemist for Cheney Brothers, silk manufacturers, has been awarded a prize of $100 by the American Association of Textile Chemists and Colorists, for his paper on "The Application of Hydrogen-Ion Determinations to Textile Problems."

THE Order of the Red Banner of Labor, said to be the highest decoration in the Soviet Republic, has been conferred on Professor S. M. Nikanorow, director of the Microbiological Institute at the University of Saratov, for his work in the control of epidemics.

THE degree of Doctor of Laws will be conferred on the following on the occasion of the bicentenary celebrations of the Faculty of Medicine of the University of Edinburgh in June: Dr. A. Balfour, director of the London School of Hygiene and Tropical Medicine; Dr. R. Howden, professor of anatomy, Durham; Sir George Newman, Ministry of Health, London; Dr. Alexander Primrose, professor of clinical surgery, University of Toronto; Sir John Robertson, professor of public health, University of Birmingham; Dr. Ralph Stockman, professor of materia medica and therapeutics, University of Glasgow; Dr. A. L. Turner, president of the Royal College of Surgeons, Edinburgh; Sir Norman Walker, formerly senior lecturer on diseases of the skin, Edinburgh, and Mr. J. T. Wilson, professor of anatomy, University of Cambridge.

THE University of St. Andrews will confer the honorary degree of LL.D. on Dr. E. F. Armstrong, director of the British Dyestuffs Corporation; Dr. George Forbes, distinguished by his pioneer work in electrical engineering and popular writings on astronomy; Mr. E. S. Harkness, of New York, founder of the Commonwealth Fund, and Professor E. T. Whittaker, professor of mathematics and dean of the Faculty of Arts in the University of Edinburgh. The degrees will be conferred at the graduation ceremonial to be held on June 29.

DR. VICTOR C. JACOBSON, professor of pathology in Albany Medical College, has received a grant of $1,200 from the committee on scientific research of the American Medical Association, for further experimental studies in autotransplantation of endometrial tissue.

A GRANT of 4,000 francs has been made by the French Academy of Sciences, to Father Lejay, of the Zi-ka-wei Observatory, in order that he may complete his investigations of atmospheric electricity.

THE following officers have been elected by the Alabama Academy of Science, which met in Birmingham, on March 26 and 27, for the year 1926–27: *President,* Stewart J. Lloyd; *First Vice-president,* Walter C. Jones; *Second Vice-president,* John F. Duggar; *Secretary-treasurer,* John R. Sampey.

AT the annual meeting of the Illinois State Academy of Science new officers for the year were elected as follows: Willard N. Clute, *president;* Dr. Mary M. Steagall, *first vice-president,* and Dr. L. J. Thomas, *secretary.* The other officers were reelected.

AT the recent annual meeting of the Sigma Xi Alumni Association of the University of Pittsburgh, the following executive officers were unanimously reelected for the year 1926–27: Professor K. D. Swartzel, *president;* Dr. O. H. Blackwood, *vice-president;* Dr. Richard Hamer, *secretary-treasurer.*

B. C. EDGAR, vice-president and general manager of the Tennessee Electric Power Company, has been

elected president of the Southeastern division of the National Electric Light Association.

THE National Medical Association of China at its sixth biennial conference held in Shanghai in February, 1926, elected as its president, to serve for the next two years, Dr. Jui-heng Liu, medical superintendent of the Peking Union Medical College.

RAYMOND L. DITMARS, curator of reptiles and assistant curator of animals in the New York Zoological Park, has been promoted to the position of curator of mammals.

ACCORDING to *Terrestrial Magnetism,* Wallace M. Hill, magnetic observer, relieved Lieutenant R. J. Auld of the charge of the new magnetic observatory near San Juan, Porto Rico, early in March.

DR. HARALD U. SVERDRUP, in charge of the scientific work of the Amundsen Arctic expedition, aboard the *Maud,* 1918–1925, has been appointed research associate of the Carnegie Institution of Washington for the period March–August, 1926, in order to enable him, in cooperation with the Department of Terrestrial Magnetism, to complete the reduction and publication of his observations, chiefly in terrestrial magnetism and electricity.

DR. C. J. HUMPHREY, of the Forest Products Laboratory, U. S. Forest Service, Madison, has been appointed to the position of mycologist, Bureau of Science, Manila, Philippine Islands, where he will direct the research work of the bureau in mycology and plant pathology. He will sail from San Francisco on May 29 to assume his new duties.

DR. W. A. TAYLOR, research chemist for E. I. duPont de Nemours and Co., has been elected president of the LaMotte Chemical Products Co., of Baltimore.

PROFESSOR E. E. FAIRBANKS, of the U. S. Bureau of Mines, stationed at Reno, Nevada, has been appointed to the sales staff of E. Leitz, Inc., manufacturers of laboratory apparatus and supplies.

DR. RALPH G. MILLS, head of the department of pathology, University of Colorado School of Medicine, has resigned to accept a position on the permanent staff in pathology of the Mayo Clinic, Rochester, Minn., which carries with it a full professorship in pathology at the University of Minnesota.

AT the Ohio Agricultural Experiment Station, several appointments have been made in the department of botany and plant pathology for the summer of 1926. Dr. W. G. Stover, professor of botany in charge of plant pathology at the Ohio State University, is spending a six months' leave conducting research on several phases of the mosaic diseases of plants. Dr. J. D. Sayre, also of the university, has been appointed half-time assistant at the station and will investigate root rots. Mr. H. A. Runnels, of the university, holds the Grasselli Chemical Company fellowship. Dr. Lex R. Hesler, of the University of Tennessee, will work for three months on some special spraying and dusting experiments. Dr. J. D. Wilson, recently assistant in plant physiology at the Johns Hopkins University, has been appointed assistant pathologist, effective July 1.

THE Buenos Aires correspondent of the *Journal* of the American Medical Association writes that the recent and untimely death of Dr. Juana Petrocchi, noted for her entomologic work, has left vacant the position of chief of the entomologic division of the national department of health. Through the agency of the Rockefeller Foundation, Mr. William Shannon, an American, has been appointed to replace her. Dr. E. del Ponte will aid him in his studies of insects as disease carriers.

DR. SAMPAIO FERRAZ, director of the Brazilian Meteorological Service, will be on leave from April to September on account of his health. In his absence the service will be in charge of Dr. Francisco Souza.

DR. HERBERT J. SPINDEN, of the Mason-Spinden Expedition to Central America, which left last January, arrived in New York on May 23 with a collection of Indian materials from North Honduras and the islands of that coast.

DR. A. E. VERRILL, emeritus professor of zoology at Yale University, has returned to New Haven from the Hawaiian Islands with a large collection of marine fauna.

DR. ALFRED P. DACHNOWSKI, of the U. S. Bureau of Plant Industry, sailed for Europe on May 19 for the purpose of comparing areas of peat in other countries with different peatlands in this country. He will visit the experiment stations and institutes of several countries and make a study of the progress in peat investigations and peatland agriculture.

DR. CARL J. WIGGERS, professor of physiology in the School of Medicine, Western Reserve University, will spend the summer in Europe. Early in July he will attend physiological meetings at Oxford University. In August he will go to the twelfth annual International Congress of Physiologists, where he will present a paper.

PROFESSOR C. L. STARR, of the University of Toronto Medical School, recently returned from the Harvard Medical School, where he assumed the chair of surgery for four weeks during the absence of Professor Cushing in Europe.

DR. JOHN M. COULTER, of the Boyce Thompson Institute for Plant Research, recently delivered a lecture entitled "Original Explorations of Yellowstone Park," before the West Virginia Scientific Society and the Sigma Xi Club of West Virginia University.

DR. W. V. BINGHAM, director of the Personnel Research Federation, gave an address under the auspices of the Graduate College of the University of Iowa on "Personality in Vocation," on May 17.

DR. S. O. MAST, professor of zoology in the Johns Hopkins University, recently gave two lectures in St. Louis; one on "The Nature of Science" before the Johns Hopkins alumni, and the other on "Structure and Locomotion in Amoeba" before the faculties and graduate students of Washington and St. Louis Universities.

DR. E. M. SPIEKER, assistant professor of geology at Ohio State University, addressed the geological society at the University of Cincinnati, on April 29, on problems of Cretaceous stratigraphy and sedimentation.

THE twenty-fourth Rush Society lecture was given at the College of Physicians, Philadelphia, by Dr. W. E. Dixon, of Cambridge, England, on "The Chemistry and Significance of the Pituitary Gland," on May 14. The twenty-fifth Rush Society lecture was given by Dr. H. M. Marvin, assistant professor of medicine at Yale University Medical School, on "The Significance and Choice of Diuretics for Cardiac Patients," on May 18.

IT is proposed to establish a Ralph Winfred Tower Memorial Fund of $100,000 or more to be used for the library of the American Museum of Natural History. Dr. Tower, who died in January, served as museum librarian for twenty-three years, during which he assembled what is regarded as the finest collection of books on natural history in the country.

AT the Detroit meeting of the American Public Health Association Dr. Victor C. Vaughan proposed a memorial in honor of Professor Sedgwick. This will take the form of a medal which may be awarded from time to time for distinguished service in public health. Another effort is being made by students and friends of Professor Sedgwick which will take the form of a lectureship in his honor.

PROFESSOR JOHN J. FLATHER, head of the department of mechanical engineering at the University of Minnesota, died on May 14, aged sixty-four years.

ROSCOE E. DOOLITTLE, chief of the central district of the U. S. Bureau of Chemistry, died on April 25, aged fifty-two years.

HENRY BROUGHAM GUPPY, F.R.S., known for his work in botany and geology, has died aboard the French steamer *El Kantara* at Martinique in the West Indies, aged seventy-two years.

THE American Society for Testing Materials will meet in Atlantic City from June 21 to 25, under the presidency of W. H. Fulweiler, chemical engineer for the United Gas Improvement Co., Philadelphia.

THE fiftieth annual session of the American Association for the Study of the Feeble-Minded will be held at the King Edward Hotel, Toronto, from June 3 to 5. Dr. A. R. T. Wylie, of Grafton, N. D., is president and Dr. Howard W. Botter, of Thiells, N. Y., secretary-treasurer.

PROFESSOR J. J. WILLAMAN, secretary of the division of biological chemistry of the American Chemical Society, sends the following information regarding the Tulsa meeting: The division of biological chemistry joined with the division of agricultural and food chemistry in the symposium on cotton and its products. Two of the papers on that symposium were contributed from the division. These were "Gossypol and Cottonseed Meal Poisoning," by E. W. Schwartze, and "Feeding Value of Cottonseed Meal," by G. S. Fraps. In the general program three out of the ten papers dealt with vitamins. It was announced that the treatment of milk with ultra-violet light increases its potency in vitamin D, but it destroys much of the vitamin A. The process then would be of questionable value. Different samples of yeast vary considerably in their vitamin B content, a fact which must be taken into consideration before a substance such as vitamin E can be said to exist, according to Parks and Nelson, of the Iowa Experiment Station.

THE United States Civil Service Commission announces an open competitive examination for mathematicians, receipt of applications for which will close on June 22. The examination is to fill a vacancy at the Aberdeen Proving Ground, Aberdeen, Maryland, and vacancies occurring in positions requiring similar qualifications throughout the United States. The entrance salary for the position at the Aberdeen Proving Ground is $4,000 a year. In the Departmental Service, Washington, D. C., the entrance salary is $3,800 a year.

ACCORDING to the terms of the will of the late Wood Fosdick, of New York, who died on April 6, the American Museum of Natural History is named as residuary legatee of the estate, which it is believed will add nearly $1,000,000 to the endowment fund.

PLANS for the establishment of a training school for museum workers were announced on May 17, at the opening of the twenty-first annual conference of the American Association of Museums in the American Museum of Natural History. Chauncey J. Hamlin, of Buffalo, president, presided at the session.

The school will be operated from the headquarters of the association and will prepare directors and curators for museum service. At its inception there will be five art students who will travel to various museums of the country, studying the work of group building, mounting, case building and cataloging and the specialties required in museum supervision. The school will enroll only graduates of universities.

A GIFT of $100,000 to the Engineering Foundation's research endowment fund by Edward Dean Adams, president of the Niagara Power Company, was announced at a meeting of the foundation on May 19, at the Union League Club. The gift of Mr. Adams, who was guest of honor at the meeting, will be added to the research endowment fund, which now totals $650,000. His was the third large gift to that fund. The other two were $500,000 by Ambrose Swasey, telescope manufacturer, of Cleveland, Ohio, and $50,000 under the will of Henry R. Towne. The Engineering Foundation has set $20,000,000 as the goal for its research endowment fund, which is to be used in promoting scientific research in engineering in the universities and industries of the United States. The foundation voted to allot $30,000 for a three-year program of research in blast furnace slags at the University of Wisconsin and $10,000 to Johns Hopkins University for two years of research in electrical insulation under the direction of Professor J. B. Whitehead.

UNIVERSITY AND EDUCATIONAL NOTES

DARTMOUTH COLLEGE has received from an anonymous donor $1,000,000 to be used for the construction of a new library.

COMPLETION of the first year of the fifteen-year drive of the University of Pennsylvania for an endowment fund of $45,650,000 has resulted in subscriptions amounting to $7,500,000; subscriptions were received during the year from 10,868 persons, of whom 10,467 were former graduates or students.

GEORGE F. BAKER, New York banker, has given $30,000 for use in the Baker laboratory of chemistry at Cornell University, which he gave to the university several years ago at a cost of more than $1,500,000.

CLARENCE MACKAY, of New York, has given $100,000 for the enlargement of the Mackay School of Mines at Reno, Nevada. The gift is in addition to a new science building Mr. Mackay already has promised to the institution.

DR. FREDERICK G. KEYES, director of the research laboratory at Massachusetts Institute of Technology, will join Brown University next September as consulting professor in physics. He will go to the university one day a week and with Professor Albert De Forest Palmer have charge of the department of physics, from which Dr. Carl Barus will retire as head next month.

DR. COLLINS P. BLISS, professor of mechanical engineering at New York University, has been appointed associate dean of the college of engineering.

THE new chair of associate professor of geology established at the University of Tennessee last June has been filled by the appointment of Dr. George M. Hall, instructor of geology in the Johns Hopkins University.

DR. GRACE BERKLEY has been elected assistant professor of botany in De Pauw University.

DR. MARY WESTALL has been appointed assistant professor of botany in Agnes Scott College, Georgia.

DR. ARTHUR L. BLOOMFIELD, of the Johns Hopkins University, has been appointed professor of medicine at the Stanford University Medical School, the appointment to take effect at the beginning of the year 1926–27.

DISCUSSION AND CORRESPONDENCE

THE CASE OF ASTACUS, 1775, VS. POTAMOBIUS, 1819

OUR excuse for reopening this much discussed case of nomenclature is practical, not merely academic. In preparing a paper in which reference is made to *Crustacea*, the point has come to our attention that, while specialists in this group settled this case years ago, two of the most recent American text-books in zoology disagree in respect to it.

Pratt, 1916, "Manual of the Common Invertebrate Animals," p. 390, uses the generic name *Astacus* Fabr., 1775, for the crayfish. In Ward and Whipple, 1918, "Fresh-Water Biology," p. 846, Ortmann uses the generic name *Potamobius* Leach and states that, "This is the genus which includes the European crayfishes, frequently, but incorrectly, called *Astacus*."

Faxon, 1898, PUSNM, pp. 662–665, gives a detailed discussion of these names. We agree with Faxon's conclusions, but invite attention to the point that under the International Rules of Zoological Nomenclature the case is much clearer than is ordinarily assumed.

Astacus Fabr., 1775, 413, contained a number of species, including as number 2 *Astacus fluviatilis* Fabr., 1775, 413, with *Cancer astacus* Linn., 1758a, 631, as synonym. To establish the correct generic name for *Astacus fluviatilis*, we do not have to go beyond this reference; *Cancer astacus* Linn. is the type, by absolute tautonymy, of *Astacus* Fabricius. See Article 30d International Rules of Nomenclature.

In addition, Latreille, 1810, 422, definitely designated *Astacus fluviatilis* as type of *Astacus*.

Potamobius Leach in Samouelle, 1819, EuC, 95, was proposed as a new genus with *Potamobius fluviatilis*, syn. *Cancer astacus*, as monotype. Accordingly *Potamobius*, 1819, is an objective synonym of *Astacus*, 1775.

"*Astacus* Leach's MSS." in Samouelle, 1819, EuC, 95, is cited as if it were the publication of a new genus, monotype, *Astacus gammarus* Linn., syn. *Astacus marinus* Fabr., "the common lobster" of the London markets, from Scotland, Norway, European ocean. If this be interpreted as a new genus, the name is a dead homonym of *Astacus*, 1775; if it be interpreted as a division and restriction of *Astacus*, 1775, the elimination of *fluviatilis* syn. *astacus* is contrary to Article 30d of the International Rules.

All later references, together with the discussions as to the course adopted by Milne-Edwards, and others, are irrelevant under the International Rules.

This particular case is more than one of simple academic nomenclature. It involves the technical names of several animals which come into important consideration in connection with the subject of food poisoning and food inspection; and, however much systematists may differ in argument and opinion in respect to the names of animals discussed only in technical publications, it seems desirable that the technical names which eventually get into administrative work and even into law should be as uniform and unambiguous as possible.

Dr. Ortmann, after reading the foregoing discussion, writes us under date of February 4, 1926, that he concurs in the views expressed here.

C. W. STILES
CLARA EDITH BAKER

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U. S. PUBLIC HEALTH SERVICE

THE DECOMPOSITION OF CERTAIN TOXINS BY KNOWN ORGANISMS[1]

SINCE the writer[2] reported that vanillin decomposing organisms do not decompose resorcinol, cumarin, quinoline, benzidine or caffein in dilute solution cultures it has seemed desirable to test several known organisms from the Parke Davis Laboratory and from the Laboratory of Public Health, for their ability to decompose such toxins as vanillin, cumarin, caffein and resorcinol in solution cultures.

Suitably modified Robbins' solution, containing vanillin, was prepared and inoculated in duplicate with pure cultures of the organisms listed below. After incubation at room temperature for about one month observations for the growth of the organisms and tests for the decomposition of the vanillin were made.

It was found (a) that Bacillus Hartlebii, Bacillus cyanogenus, Bacillus carotovorus, Bacillus phaseoli, and Bacillus mycoides failed to grow or to decompose the toxin; (b) that Bacillus tumefaciens, Staphylococcus, tetragenus, Bacillus megatherium, Bacillus aerogenes, Bacillus coli communis, Bacillus prodigiosus, Micrococcus tetragenus, Spirillum rubrum, Aspergillus fumigatus, Bacillus tracheophilus, Vibrio Metchnikovii, Vibrio tyrogenus, and Azotobacter chrococcum, grew but did not decompose it; (c) while, on the other hand, Pseudomonas pyocyaneus and Bacillus fluorescens liquifaciens did decompose it.

It appears from these results that though the organisms multiplied in many cultures sufficiently to render the solution turbid yet there was decomposition of vanillin by two organisms only.

In case of cumarin, caffein and resorcinol, which were treated in the same way, equal care was taken that proper conditions, such as suitable substratum and correct reaction, were maintained, but in no case was there complete decomposition.

While the results are mostly negative they do in a large measure support the contention that the organisms which decompose toxins are specific.

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CAVALLINI'S "ASEXUAL CYCLE IN ARCELLA"

IN view of the existing confusion regarding the life histories of the rhizopods, especially the thecamoeba, it seems apropos to offer any available evidence that might help in clarifying this situation.

The two papers by Francesca Cavallini, *viz.* "The Asexual Cycle in Centropyxis aculeata and its Variability in Relation to Heredity and Environment" and "The Asexual Development of Arcella vulgaris," which appeared in the January issue of the *Journal of Experimental Zoology*, represent such painstaking efforts, and apparently the interpretations are so justly warranted that special attention should be called to their merits.

For the last six years I have spent most of my research time on the thecamoebae, being primarily interested in experiments other than those dealing with life histories: but during this period stages in the development of these forms have been encountered often and many observations and drawings have been made. What was interpreted to be developmental

[1] Published with the permission of the director of the Alabama Experiment Station.

[2] SCIENCE, 60, 390 (1924).

stages in several species of the thecate amoebae have been noted, but it is in the genus Arcella that the more careful study was made. For that reason the comments will be restricted to the life cycle in Arcella—though many of the stages described for Centropyxis have been seen.

Beginning with the last paragraph on page 246 Cavallini describes the splitting of the parent shell (in some cultures) and the emergence therefrom of ". . . an oval mass, 174 μ long and 78 μ wide, full of spherical refractive bodies of different sizes. . . ." This phenomenon has never been observed by me[1]; although the spherical refractive bodies have been seen inside the shell and also in irregular masses of protoplasm protruding through the mouth of the shell. These refractive bodies have been isolated and amoebulae have been obtained from them.

It was found that growth and division of the amoebulae take place as described by Cavallini, the process being repeated so many times that I was forced to the tentative conclusion that I was dealing with a small amoeba which had nothing to do with Arcella. The process of shell formation has been observed in mass cultures and my observations agree essentially with Cavallini's; although she does not make it clear how the thecate form, which at first is nearly spherical, assumes the typical shape of the adult Arcella. This seems to be brought about, at least in part, by invagination.

There are two things in Cavallini's paper which should be specially pointed out: (1) My observations agree with hers regarding the lack of evidence for macro—and micro—gametes, yet my experiments have not been sufficiently controlled to preclude such a possibility and if hers were she has failed to give convincing evidence to that effect. (2) She says nothing concerning the cause of "sporulation." The season of the year in which her work was done is the same as that in which I found this phenomenon most marked, yet by changing the culture medium daily I have carried hundreds of Arcellae throughout the year without any evidence of "sporulation" or diminution in the rate of vegetative reproduction. On the other hand, these amoebulae have appeared in old cultures at practically all seasons of the year, but they occur much more commonly during the late autumn and winter months.

In concluding I wish to state that the evidence I have agrees more closely with Cavallini's account of the life-histories of these thecate amoebae than with that given by any other author.

BRUCE D. REYNOLDS
UNIVERSITY OF VIRGINIA

[1] This may be accounted for by the fact that *A. polypora* and *A. discoides* were used principally.

THE TROPICAL RESEARCH STATION OF THE NEW YORK ZOOLOGICAL SOCIETY

THE Tropical Research Station of the New York Zoological Society, located at Kartabo, British Guiana, will be open this summer for a limited number of men and women capable of carrying on independent biological research.

The station has been used by the University of Pittsburgh for the past two summers, courses in field zoology being offered by Dr. Alfred Emerson in 1924 and by Dr. S. H. Williams in 1925.

This year it will be sponsored by Mr. William Beebe, director of tropical research of the New York Zoological Society and founder of the station. The laboratory will be managed by Jay F. W. Pearson, a member of tropical research staff, assisted by Mrs. Pearson.

The party will leave New York about June 12 and will return September 12.

The expenses of each person will be approximately $750.00, including transportation, living expenses and incidentals after leaving New York. Stops will be made en route at the West Indian Islands of Grenada and Trinidad.

All communications and applications should be addressed to the undersigned at the department of zoology, University of Pittsburgh, Pittsburgh.

JAY F. W. PEARSON
UNIVERSITY OF PITTSBURGH

SCIENTIFIC BOOKS

Taxidermy and Museum Exhibition. BY JOHN ROWLEY; Preface by Frank M. Chapman. D. Appleton and Company, New York, 1925 (our copy received December 26). Octavo, pp. xvi + 331, 29 plates, 20 figs. in text. $7.50.

THIS book is the result of thirty-five years of continuous experience in devising and applying the technique of museum exhibition. As Dr. Chapman says in the preface, John Rowley has always held the highest ideals of the taxidermist's art and has fortunately been so situated that he has never been obliged to sacrifice them. The exhibits prepared by him in several different museums, notably those in the California Academy of Sciences building in Golden Gate Park, San Francisco, form an enviable record of achievement in this worthy line of endeavor.

Twenty-seven years ago Rowley wrote "The Art of Taxidermy," a book which registered the foremost accomplishments of that day. The author states in the forepart of the present book that the passage of a quarter of a century has seen the development of so many ideas and improvements in museum matters that but few of those described in the earlier volume are now being applied. The present book sets forth the

latest methods and formulae, so far as known to its author, and will therefore be welcomed far and wide among the very many museums of the country. It will be of immediate value to preparators and administrators, most especially in museums being newly established; and the numbers of these are increasing year by year. The museum is taking its place with the library as an agency of public instruction.

There are chapters in Rowley's book on the gathering of specimens for mounting, on tools and materials required, on formulae, on casting, modelling and making moulds, on the special treatment for fishes and reptiles, on the very important subject of accessories, including artificial plants and flowers in wax and celluloid, and finally on the proper assembling of groups and the construction of cases and backgrounds —all these subjects receive full attention upon the basis of exhaustive first-hand experience.

Rowley's book is written exclusively from the preparator's point of view, and it is the present reviewer's purpose now to call attention to certain features of it which bear on matters outside of that particular field. In giving various tanning or pickling formulae the author points out the danger in the use of salt brine, either alone or in combination with alum or acid, in that this solution changes the texture and certain colors of the hair of mammals. "Bright yellows are transformed to a dingy yellow and dark yellows are changed to purple and brown" (p. 115). This fact, of the use of brine pickle, has, as rightly stressed by Rowley, who cites instances, resulted in quantities of supposedly "scientific" material reaching museums proving practically worthless. And yet the preservation of pelts in brine, or the passage of them through salt solution in the tanning process, has been, and probably remains, a very general procedure in museums. Rowley's book will be vastly worth while, from a truly scientific standpoint, if it will have served to terminate this custom.

Another thing that Rowley rightly deplores is the exposure of mounted mammals and birds to daylight. An exhibit which is exposed to strong daylight "is a waste of time and money, if the exhibit is designed to be a permanent one. It is bound to fade in time and the whole thing is not worth while." Rowley argues for artificial lighting, whereby the fading or bleaching is reduced to a minimum; during non-exhibition hours the lights can be turned off, leaving the groups in absolute darkness. Rowley refers definitely to a series of very expensive groups installed in a prominent museum which, "after only eight years' exposure to top daylight, already show the bleaching effects of daylight" (p. 319).

The present reviewer would go farther and designate as a biological crime the placing upon continuous daylight exhibition type specimens, or *any* specimens of rare or vanishing species of animal. The custom of sending expeditions for "group material" for such purpose to territories where disappearing species are making their last stand for existence is to be condemned without reservation. The only justification for killing, then, is for the purpose of preserving scientific specimens under conditions insuring greatest permanence in texture and coloration—which is *not* under the usual exhibition conditions.

Rowley has much of marked value to say from his experience in regard to the construction of cases for artificial lighting, as well as also in regard to the construction of buildings for the specific purposes of exhibition. "The greatest trouble with museum buildings has been that the general plan has been left to an architect who knew nothing about the exhibition side of a museum and cared less. His sole idea was to erect a fine-looking building—one which would be a monument to himself. The result has been that, when completed, the structure has utterly failed as an exhibition museum" (p. 317).

Rowley has things to say of a pungent nature in regard to museum administration. For example: One "mistake that is quite common is for museum founders to try to combine art, history and science in one institution and under one head. . . . If started in this way, the sooner the charter is amended so as to eliminate one or the other, the better for the institution" (p. 323). "A museum which is built and owned entirely by a municipality is a purely political institution and as such will in all probability never expand and develop into a great institution. Both the heads and the employees owe their positions to political influence, and qualification in many instances is not considered. . . . The city authorities who furnish the money rarely know anything about the demands of a museum or how the funds should be spent" (p. 322). "The common mistake is to select a museum director from the ranks of scientific men. No greater error can be made" (p. 324). The head of a museum should be a "broad-minded business man of good personal appearance and 'mixing' qualities." His duties should be to "look after the large affairs of the institution, to meet and interest people, and get donations and bequests. . . ." "A director who has spent a term of years in an institution has been simply a time-server if the building has not grown or expanded during his administration."

Some of the above opinions in regard to museum administration are, it will be noted, strikingly similar to ideas that have been expressed elsewhere in regard to university administration. While the reviewer finds himself in sympathy with several of the above expressions by Mr. Rowley, he would point out one prin-

ciple that he believes holds with the natural history museum precisely to the same extent that it does with the college; namely, that to fulfil its function in highest degree the teaching in both the museum and the college must be backed up by the soundest sort of scientific achievement. And very rarely in the museum are those concerned solely with exhibition gifted with the scientific mold of thought. There can be no really successful exhibition museum, nor teaching university, unless it include among its workers, if not at its head, men with scientific instincts, men who are at least as proficient as investigators as they, or others on the staff, are as exhibitors or teachers. The public museum, rightly conducted (that is, for purposes of instruction rather than primarily for amusement) ranks as an agency for general education along with the school and college. At core, in both, there must be the scientific spirit, the spirit that seeks for truth to the farthest detail, and expounds the truth accurately.

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SPECIAL ARTICLES

ARE DROMATHERIUM AND MICROCONODON MAMMALS?

DROMATHERIUM and *Microconodon* from the Triassic of North Carolina have long been cited as the oldest known mammal jaws and as such they are mentioned in practically all text-books of historical geology. Although briefly described by Emmons as early as 1857,[1] the only detailed study of these unique remains has been that of Osborn.[2] Since 1887 our knowledge of the mammal-like reptiles has been very greatly increased and one or two writers have tentatively questioned the correctness of referring the two American genera to the true mammals. Through the kindness and cooperation of Dr. G. H. Chadwick, professor of geology in Williams College, and of Dr. Witmer Stone, director of the Museum of the Academy of Natural Sciences in Philadelphia, the writer has recently had an opportunity to examine the originals under very favorable conditions and with the best modern optical aids with a view to determining, if possible, the true zoological position of *Dromatherium* and *Microconodon*. The present brief note is a preliminary statement of results; a more detailed paper with new figures will follow elsewhere.

The following are the most valuable criteria for distinguishing between the isolated lower jaws of mammals and of reptiles:

(1) In reptiles the lower jaw is compound and the articular and quadrate intervene between the dentary and squamosal. In mammals the lower jaw is simple and the dentary articulates with the squamosal.

(2) In reptiles[3] the cheek teeth have but one root. In mammals[4] most or all of the cheek teeth have two or more roots.

(3) Certain molar patterns are known only among reptiles and others, even more distinctive, are known only among mammals.

Of these criteria the first is diagnostic and the others, while usually of more practical value, are empirical. Applying them to the problem in hand:

(1) The single bone preserved in each case is not larger relative to the dentition than is the dentary of many cynodonts. In the latter reptiles the other elements of the jaw are much reduced and lie loosely against the inside of the dentary, whence they are often lost during or before burial. Both *Dromatherium* and *Microconodon* appear to be exposed on the outer side only, but even if this were not true it is doubtful whether the former simple or compound nature of these jaws could be positively asserted. Both fragments are unfortunately broken posteriorly, but there is reason to believe that this break was very close to the original posterior margin. In neither case is there any evidence of an articular condyle on the dentary. In *Dromatherium*, at least, it is very unlikely that such ever existed for there is no thickening such as is necessary for the support of this condyle in the mammals and the dentary seems to end posteriorly as a thin flat blade of bone, as does that of the cynodont reptiles. In *Microconodon* there is a thickening which might have supported a condyle but there is no evidence that it did so, and it is hardly more marked than a similar feature in some reptiles.

(2) In the cheek teeth of *Microconodon* there is a single, undivided root and the same is very probably true of *Dromatherium*, although here observed with a little less certainty. In both, however, an incipient root division is seen in a median longitudinal constriction of the roots of the posterior teeth. Such a constriction is very common among cynodonts and may even occur in a somewhat less marked form in some theromorphs of quite indirect mammalian relationships. All undoubted Mesozoic mammals, including some as old as *Dromatherium* and *Microconodon*, have clearly and completely divided premolar and molar roots.

[1] "American Geology," etc., p. 93.

[2] Proc. Acad. Nat. Sc. Phila., 1886, p. 359. Proc. Am. Phil. Soc., xxiv, 1887, p. 109.

[3] With very rare exceptions which could not possibly confuse the issue.

[4] With the exception of some highly specialized and degenerate forms which, again, can not obscure the issue in the present case.

(3) In *Dromatherium* the molar pattern is variable, the first two molars consisting essentially of a single high cusp with very minor anterior and posterior accessory cusps, asymmetrically placed, and the succeeding molars consisting essentially of a high anterior cusp with a single posterior accessory cusp of varying size. The variability and asymmetry are quite unlike the most nearly similar mammals (the triconodonts) and the pattern of the posterior molars is entirely unlike anything known among mammals but very closely similar in ground plan to that of a number of mammal-like reptiles, such as *Cynosuchus* and *Glochinodon*. The molar pattern of *Microconodon* is more mammalian in aspect and, except for its asymmetry, somewhat resembles that of the most primitive triconodonts. There are cynodonts, however, such as *Ictidopsis*, which resemble the triconodonts more closely than does *Microconodon* and there are other cynodonts, such as the well-known *Cynognathus*, the molar pattern of which is much closer to that of *Microconodon* than is that of any known mammal.

In conclusion, on the basis of the present material it is not possible to settle the systematic position of *Dromatherium* and *Microconodon* beyond all doubt. It is possible, however, to say that many of the characters which they exhibit resemble the cynodonts much more than they do any known mammals, that none of the characters which they exhibit resemble any known mammals more than they do the cynodonts, and that none of the characters which they exhibit involve any difficulty in their reference to the Cynodontia. It is, therefore, not justified by our present knowledge to consider *Dromatherium* and *Microconodon* as mammals and they should, at least until further material is forthcoming, be referred to the Reptilia. In the latter class they certainly must be placed in the group Cynodontia, under which each of them must probably be considered the type of a distinct family in view of the great differences between them in tooth pattern and jaw form. This does not, of course, deprive these forms of interest with regard to the origin of mammals and they were probably quite near the ancestry of the latter, although probably not more so than any of the other known small cynodonts. That they were not directly ancestral to any known mammals is certain.

Through the cooperation of Professors Chadwick, Brinsmade and McElfresh, of Williams College, an interesting new point of technique was developed which may be of use to some other students of small and obscure forms. In studying *Dromatherium*, the better preserved but more obscure specimen of the two, great difficulty was experienced in observing the boundary between the black teeth and equally black matrix (coal). After experimenting with various ray filters and color screens, it was found that by using the unmodified light from a small laboratory mercury arc in quartz very remarkable results were obtained. This light, rich in ultra-violet, set up a bluish fluorescence in the teeth which, while faint, was sufficient to distinguish them quite clearly from the unmodified black of the coal. Care must, of course, be taken to shield the eyes from the direct radiation of the arc, but the lenses of the compound binocular microscope through which, in this case, the specimen is viewed remove the harmful rays.

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VIABILITY OF DESICCATED OR GLYCERINATED CELLS OF A CHICKEN SARCOMA

IT is a matter of general knowledge that some microorganisms are resistant to drying and to the action of glycerin, and the revival of desiccated lower forms of animal life is not a rare phenomenon in experimental biology. It has not been suspected that the cells of as high an animal as the chicken are resistant to these processes.

In recent experiments I was able to show that the cells of the Rous chicken sarcoma No. 1 withstand the processes of desiccation and of glycerination. I am indebted to Dr. James B. Murphy, of the Rockefeller Institute for Medical Research, New York, for a quantity of the desiccated tissue of the chicken sarcoma. Some of my experiments were carried out with this desiccate, while others were based on new tumor material obtained in this laboratory by injecting the desiccate into chickens. The desiccate sent to me by Dr. Murphy was prepared October 8, 1925, and was used in my experiments four months later (the early part of February, 1926). Material prepared in this laboratory was dried in the desiccator over calcium chloride in a partial vacuum, and was kept in sealed glass tubes for two to six weeks before it was used.

A small portion of the dried and pulverized material, proved to be capable of producing sarcoma by injecting into chickens, was ground up into a viscous suspension in a mortar with the addition of an adequate quantity of sterile physiological salt solution. This suspension was examined microscopically with the addition of an appropriate amount of trypan blue dissolved in normal salt solution. It showed a large number of cells with the morphological appearance of living cells. The nuclei of these cells were very slightly bluish, and were not deep blue as in the case of dead cells, the nuclear permeability of dead cells to certain dyes being a well-known fact. Stained smears made of this suspension also showed numerous live-looking cells with well-stained nuclei and cyto-

plasm free from signs of degeneration. When such a suspension is incubated at 37° C for two or three hours, the cells, instead of disintegrating, continue to appear normal. When placed in a drop of chicken plasma, according to the established method, and kept at 37° C for a few hours, the cells are seen to migrate out actively toward the periphery of the culture media.

If the suspension is deprived of its power to produce sarcoma by heating or by treatment with alcohol, smears no longer show the normal-looking cells. The cells after these treatments assume the morphological appearance of death, showing marked pycnosis, karyorrhexix, etc. It was also noted that desiccated mouse or rat tumor cells are completely necrotic when suspended in salt solution and examined microscopically.

The above facts, repeatedly observed in a large series of experiments, may be regarded as proving that the desiccated cells of the Rous sarcoma No. 1 are not dead but are capable of revival.

The process of glycerination was also believed to be fatal to the cells of the chicken sarcoma, as it is to mammalian tumor cells. In repeated experiments I have found that this process is inadequate to rule out the viability of sarcoma cells. Briefly, these experiments were carried out as follows:

An emulsion of fresh sarcoma cells, strained through a fine wire mesh and ground fine in a mortar, was placed in 50 per cent. glycerin and kept in the ice box for one week. Cells were then washed in normal salt solution and examined microscopically. The majority of the cells had an entirely normal appearance, and their nuclei were impermeable to trypan blue. In the plasma media these cells showed the phenomenon of migration characteristic of the living cells.

These observations open up the question as to the existence of the so-called causative agent in avian sarcomas. It will be remembered that three methods have been used to demonstrate the existence of the agent which is separable from sarcoma cells, namely, filtration, desiccation and glycerination. It has been taken for granted that these processes either completely eliminated or killed the cells, leaving the causative agent viable. Judging from the fact that mammalian neoplasms have been occasionally transmitted by the Berkefeld filtrates, it is doubtful if the filtrability alone can be accepted as conclusive evidence. If desiccation or glycerination does not kill the sarcoma cells, as my experiments indicate, the question of the causative agent, separable from the cells, would seem to require a careful reconsideration. However, it is not my purpose here to discuss the existence or nonexistence of the hypothetical agent. Suffice it to say that the remarkable viability of the sarcoma cells demonstrated in the above experiments should be of significance in the study of the transmissibility and etiology of avian new growths.

Fuller accounts of experiments referred to in this note are due to appear in the March, 1926, issue of *Gann*, Vol. XX, No. 1, the journal of the Japanese Society for Cancer Research.

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THE GOVERNMENT INSTITUTE FOR INFECTIOUS DISEASES, TOKYO

THE MAGNETIC PROPERTIES OF ATOMS

IN view of the great interest attaching to recent work by Gerlach and Stern[1] on the deflection of a beam of atomic rays in a powerful inhomogenous magnetic field it seemed desirable to repeat some of this work by way of confirmation and to extend the work to other elements and molecules if possible. A Du Bois electromagnet capable of giving a normal field strength of 20,000 gauss was fitted with a wedge-shaped pole piece near which a value for $\frac{dH}{dS}$ of about $2 \times 10^5 \frac{\text{gauss}}{\text{cm}}$ was obtained. No difficulty was experienced in confirming the results on silver. The atomic rays of silver were obtained by heating a silver-plated tungsten filament. This method was found to be much superior to the pot furnace used by Gerlach and Stern since the latter gives off such quantities of gas that a vacuum is difficult to obtain.

In order to produce a beam of atoms of the alkali metals, the metal was introduced by a combined process of distillation and filtration, gas free, into a bulb connected with the apparatus. Heat was applied to the bulb externally from an electric furnace. It was found that a deposit of sodium or potassium could be obtained on a glass plate at room temperature but in order to obtain a sharp image it was necessary to construct the apparatus so that the liquid air could be applied to the outside of the receiving plate. The alkali metal images could not be "developed" as were the silver images but they may be fixed so that they can be photographed by introducing hydrogen chloride gas into the apparatus.

With a beam of comparatively wide cross section (0.2 mm) a noticeable broadening of the image was obtained but no splitting. When the width of the slits producing the beam was reduced to 0.03 mm and the slits carefully adjusted with respect to the pole pieces distinct images of the divided beam were obtained for sodium and potassium. Under the microscope accurate measurements of the splitting can be made. The calculated magnetic moment is within 10 per cent. of the value of the Bohr magneton. The deflections for sodium and potassium are inversely as

[1] *Z. Physik.*, 8: 110 (1921) et. seq.

the temperature of the vapor in agreement with the kinetic theory.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE REGULAR SPRING MEETING OF THE EXECUTIVE COMMITTEE OF THE COUNCIL

THE executive committee of the council of the association met at the Cosmos Club in Washington on Sunday, April 25, with the chairman, Dr. J. McK. Cattell, in the chair and all members present excepting Dr. F. R. Moulton, who was unable to come. Three sessions were held, one in the forenoon, a second in the afternoon and a third in the evening. The committee dined together at 6:30 in the small tea-room in the Cameron House of the club. The following items of business were transacted:

(1) The committee expressed its hearty appreciation of the excellent services being performed for the association by the executive assistant, Mr. Sam Woodley, especially in connection with the task of preparing the manuscripts for the recently published directory of members.

(2) Certain features of the organization of the Washington office were discussed and the permanent secretary was asked to study the possibilities of such changes as may render the organization more efficient, reporting the results of the study to the committee at its next meeting.

(3) One hundred and twenty-seven members were elected to fellowship, on nominations regularly approved by the section secretaries. These newly elected fellows are distributed among the several sections as follows:

Section A	4	Section K	1
Section C	7	Section M	12
Section E	3	Section N	4
Section F	86	Section O	5
Section G	5	Total	127

(4) It was voted that the formation of a new division of the association to include Nebraska, Oklahoma and Kansas, as well as Colorado and Wyoming, is not feasible.

(5) A special committee was established to make inquiry and submit further suggestions on the problem of the formation of a new division to include Colorado and Wyoming. This committee is to consist of Dr. H. B. Ward (chairman), Dr. Aven Nelson and a third person to be named by these two.

(6) Proposals to form sections on home economics and on cosmology were considered and it was voted that neither of these proposals is feasible at present. The scientific aspects of these subjects are represented in the present arrangement of sections and it seems generally undesirable to attempt to form new sections that would simply divide the field of science in a different way from that followed by the constitution. It was suggested that such borderline and overlapping fields might well be specially cultivated in the programs of the meetings, by means of joint sessions of two or more sections, the subjects for such joint meetings being stated so as to show the interrelations of the several branches of science thus brought together.

(7) Official affiliation with the association was ratified for the American Oil Chemists' Society and the American Veterinary Medical Association. Each of these organizations is to have one representative in the council of the association.

(8) Official affiliation, according to the special arrangement for affiliated academies of science, was ratified for the Alabama Academy of Science and the Pennsylvania Academy of Science.

(9) In connection with the general aim of the association to aid in the popular dissemination of scientific knowledge, a proposal was considered by which a non-technical scientific weekly publication might be organized under the auspices of Science Service (in the control of which the association takes part) with a special subscription price to members of the association. A committee was appointed, with power, to consider and decide upon this proposal, the association to take no financial responsibility. The committee consists of: Dr. J. McK. Cattell (chairman), Dr. W. J. Humphreys, Dr. Vernon Kellogg, Dr. B. E. Livingston and Dr. Edwin B. Wilson.

(10) The executive committee considered again the proposal for a non-technical illustrated monthly magazine under the control of the association, but no action seemed warranted as yet.

(11) A special committee (Dr. W. J. Humphreys, chairman, Dr. J. McK. Cattell and Dr. H. B. Ward) was appointed to consider the possibility of strengthening the appeal of SCIENCE, both on the scientific and on the popular side.

(12) Dr. M. I. Pupin was nominated to Science Service as the representative of the American Association to succeed Dr. W. W. Campbell.

(13) A committee on exhibition was established, with Dr. H. E. Howe as chairman, to have charge of the exhibition at the annual meetings. This committee is to consist of two representatives of the exhibitors, two representatives of the men of science, one representative of the city of the meeting, and, in addition, as *ex-officio* members, the president, the permanent secretary and the manager of the exhibition.